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rock. The perpendicular ledges thus exposed are much of the day in the shade, and wherever water trickles from above they become covered with an interesting and uniform moss vegetation, the species mentioned being the most characteristic. Another companion forming extensive dense mats and fruiting abundantly, is *Gymnostomum curvirostre*, but this and the *Bryum* seem able to stand a somewhat drier situation, for depauperate forms of both occur also higher up on the bluffs.

In striking contrast with this river level flora is that at the top of the bluffs, only four hundred feet higher. The most abundant and most characteristic moss here is *Grimmia teretinervis*, covering the calcareous sun-burnt sand rock, exposed to an all day sun, in black flat cushions, which are hardly recognized as plants by young students. This species is always sterile. On the same level occur also, with the same regularity, only less abundantly, *Coscinodon Raui* and *C. Wrightii*, both fruiting. Their principal companions are *Tortula ruralis*, *Tortella fragilis* and *Ditrichum flexicaule brevifolium*, all sterile.

We have thus on a small scale a real arid region moss flora at the tops of our Mississippi bluffs enjoying essentially the conditions prevailing in dry countries. While at the base, near the river level, there thrives another uniform flora characteristic of better watered regions. And the interesting part is the fact that this narrow strip in altitude extends for fully a hundred miles or more along our Great River.

This peculiar parallelism is made possible by the geological formation, the several alternating strata of Lower Silurian lime and sand rock lie in the Upper Mississippi Basin nearly as horizontal as when they were laid down millions of years ago, so that the Great River with its tributaries large and small, has made its valley by erosion through these strata establishing identical conditions at the two levels referred to.

Winona, Minn.

DIE EUROPÄISCHEN LAUBMOOSE.

By G. Roth, Leipzig, Verlag von Wilhelm Engelmann.

JOHN M. HOLZINGER.

This bryological work comprises two 8vo. volumes of considerable size and appeared in parts in rather rapid succession since early in 1904. The first volume comprises the Cleistocarpi and Acrocarpi to Bryaceae, and covers five hundred and ninety-eight pages of printed matter, exclusive of thirteen pages of Table of Contents, and fifty-two plates closely crowded with drawings of microscopic details of the species described. The second volume, completed in 1905, concludes the Acrocarpi and completes the Pleurocarpi, covering seven hundred and thirty-three pages, accompanied by sixty-two plates similarly replete with figures. The descriptions are accurately drawn up and go into details after the fashion of Limpricht, supplementing in a very helpful way the short and often too incomplete descriptions of many older species. Great care is taken to record the substratum, mode of occurrence and the distribution of the species treated. The legend for the

figures illustrating the species follows each description and always includes the record of the exact specimen used in making the drawings, a practice deserving to be universally adopted.

From the systematic view point this effort of Mr. Roth rounds out and brings up to date in accessible form for use, the achievements on European mosses since Schimper's monumental task on his *Bryologia Europaea*. The plates are necessarily crowded and are largely restricted to drawings of microscopic characters, so as to bring the work within the compass of reasonable accessibility.

The noteworthy feature of Mr. Roth's work is not so much in his contribution to systematic Bryology, which is considerable, as it is in his primary motive, steadfastly followed throughout, of tracing the intimate relation of the moss flora of the earth to the general economy of nature, their influence on and relation to the soil, to moisture and especially to forests. This fact will stand out more strikingly after a careful perusal of the general discussion introducing the subject, covering pages one to ninety-two of the first volume.

In this introductory treatment the author disposes first of the anatomical structure of the mosses, presenting in well sustained discussions the facts of protonema, moss stem, moss leaf, inflorescence, sporogone, propagation and distribution. And so far he is in full accord with the treatment of the subject in other comprehensive works on mosses. It is, however, in the closing essay on the general subject, covering pages sixty-two to seventy-eight, that Mr. Roth departs conspicuously from the single purpose of the systematist, in that he shows convincingly the importance and the significance of mosses in the economy of nature in agriculture, and especially in forestry. Something of a fair conception of his claims for mosses may be gained from the twelve theses he expounds in this striking essay; 1. Mosses diminish the danger of inundation. 2. They hinder gullyng of the soil and aid in the steady flow of springs by increasing the quantity of water derived from condensation and seepage. 3. They preserve the porosity of the soil. 4. They maintain and increase the humidity of the soil. 5. They aid in the formation of humus and so increase the depth of good soil. 6. They introduce the decay of rocks. 7. They effect an equalization of the temperature of the soil. 8. They may be used as bedding material by the agriculturist. 9. They constitute a useful index of conditions in the formation and improvement of meadows. 10. They likewise furnish to the forester a helpful index of climatic conditions favorable to different forest trees. The treatment of this point closes with these words, "If the forests officials who in recent years traveled all over North America for the purpose of studying the then existing forests had only brought back with them the principal representatives of the moss vegetation found in the forest regions traveled by them, we would be much more easily able to form a judgment concerning the adaptability of the several forest trees to our (German) conditions" 11. Mosses protect forest trees against the effects of too great cold. 12. On the part of man some mosses are used in the industries and in the domestic life.

While the author thus fairly exhausts the various relations of mosses to man and nature, it is worthy of note, as he confesses in the first lines of his Vorwort, that in his own case this study was primarily taken up, and reached its full proportions principally because of his conviction that a knowledge of mosses must be of great value to both the agriculturist and especially the forester. And it was his desire to facilitate their study by the practical foresters of Europe that led him in the first instance to essay the publication of his work, a motive that has given so distinctive a coloring to these two volumes.

Worthy of mention here is also the Index of the Literature of European Mosses, covering pages ninety-three to one hundred of Volume I, a supplement to which appears on pages fifteen and sixteen of Volume II, bringing all references up to date, 1905.

The writer of this notice has only one regret to record; it is due to the absence of dichotomous keys, now found in all such treatises, from this otherwise superior work. The insertion of such keys with at least the larger genera would make the books much more usable, but even without them, Mr. Roth's descriptions are very valuable to the systematic bryologist because of the microscopic details recorded. Both descriptions and drawings are a lasting monument to the ability and diligence of the author. It is to be hoped that he will also publish his work on exotic mosses, of which he states he has already drawn over two thousand eight hundred and fifty species.

Winona, Minn.

SULLIVANT MOSS CHAPTER NOTES.

The following names have been added to the list of Chapter Members since September 1st, making the total number one hundred and fifty-six: Mr. Reginald Heber Howe, Jr., Middlesex School, Concord, Mass.; Prof. H. A. Green, Tryon, North Carolina; Dr. H. E. Hasse, Soldiers' Home, Los Angeles Co., Calif.

Mr. G. K. Merrill, 564 Main street, Rockland, Me., will be glad to determine any and all species of lichens sent him provided the specimens are ample and are accompanied by full data.

NOTICE—ELECTION OF OFFICERS FOR 1906.

Please forward your ballots AT ONCE to the Judge of Elections, Miss Cora H. Clarke, 91 Mt. Vernon street, Boston, Mass. Polls close November 30th.

For President — Mr. Edward B. Chamberlain, 1830 Jefferson Place, Washington, D. C.

For Vice President — Mr. G. K. Merrill, 564 Main street, Rockland, Maine.

For Secretary—Dr. John W. Bailey, Walker Building, Seattle, Wash.

For Treasurer—Mrs. Annie Morrill Smith, 78 Orange street, Brooklyn, N. Y.